



Factors associated with not breastfeeding exclusively among mothers of a cohort of Pacific infants in New Zealand

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Abstract

Aims This study investigated the association between not breastfeeding exclusively (among mothers of a cohort of Pacific infants in New Zealand) and several maternal, sociodemographic, and infant care factors.

Methods The data were gathered as part of the Pacific Islands Families (PIF) Study. Infant feeding information was obtained through interviews with mothers (6 weeks post-birth) and from hospital records for 1247 of the 1365 biological mothers.

Results Factors significantly associated with not exclusively breastfeeding at hospital discharge included smoking, unemployment prior to pregnancy, years in New Zealand, not seeing a midwife during pregnancy, caesarean delivery, and twin birth status.

Factors significantly associated with cessation (before 6 weeks post-birth) of exclusive breastfeeding (for mothers who initially breastfed exclusively) included smoking, employment prior to pregnancy, being in current employment, high parity, dummy use, not receiving a visit from Plunket, infant not discharged at the same time as the mother, infant not sharing the same room as the parent(s) at night, regular childcare, and having a home visit for the infant from a traditional healer.

Conclusions Aside from smoking, different factors were associated with initiation and maintenance of exclusive breastfeeding. Identification of risk factors should assist targeting women who are at heightened risk of not breastfeeding exclusively.

The benefits of breastfeeding (for both infant and mother) are numerous and well documented.¹⁻³ A threshold level may exist for protection against infectious diseases for infants, with greatest protection observed with exclusive breastfeeding.² For these protective and other observed benefits, it has been recommended that the introduction of complementary foods should be delayed (in most circumstances) until the infant is approximately 6 months old.⁴ Thus, it is important to encourage mothers to breastfeed exclusively over the first few months of the infant's life.

Although breastfeeding rates in New Zealand tend to be high compared to other countries,^{5,6} exclusive breastfeeding rates appear to reduce substantially—well before the recommended 6 months.⁷ To provide opportunities for targeted intervention, and to better inform breastfeeding programmes, it is important to identify factors that may hinder the initiation or maintenance of exclusive breastfeeding for different ethnic groups in New Zealand.

An earlier study identified Pacific ethnicity as being associated with not exclusively breastfeeding at discharge from hospital.⁷ Furthermore, we have previously shown that breastfeeding rates observed in our cohort (at 6 weeks post-birth) fall below recommended national targets.⁸ The present study investigates the association

between not breastfeeding exclusively (among mothers of a cohort of Pacific infants in New Zealand) and several maternal, sociodemographic, and infant care factors.

Methods

Data were collected as part of the Pacific Islands Families (PIF) Study; a longitudinal investigation of a cohort of 1398 infants (11 pairs of twins) born at Middlemore Hospital, South Auckland, New Zealand during the year 2000. Middlemore Hospital was chosen as the site for recruitment of the cohort as it has the largest number of Pacific births in New Zealand and is representative of the major Pacific ethnicities. It was estimated that a cohort of 1000 would provide sufficient statistical power to detect moderate-to-large differences (after stratification for major Pacific ethnic groups and other key variables).

Eligibility criteria included having at least one parent who self-identified as being of Pacific ethnicity and at least one parent who was a New Zealand permanent resident. Thus, non-Pacific mothers were eligible for the study in cases where the infant's father was of Pacific descent. Detailed information about the cohort and procedures is described elsewhere.⁹

Approximately 6 weeks after the birth of their child, Pacific interviewers (fluent in English and a Pacific language) visited the mothers in their homes. Of the 1376 mothers, 1365 were biological and 11 were foster or adoptive mothers. Eligibility criteria were confirmed, and informed consent was gained for their participation in an interview and for our access to their Middlemore Hospital discharge record.

Each mother participated in a 1-hour interview (in their preferred language) about the health and development of their child, and family functioning. Questions regarding how the infant had been fed for the first 6 weeks of their life were included in this assessment.

Consistent with other studies,^{10,11} breastfeeding was considered exclusive if no other milk, formula, or solids were given apart from liquids such as water. Combination breast-and-formula feeding and formula-only feeding were therefore considered as 'not breastfeeding exclusively'. Several variables were examined for associations with 'not breastfeeding exclusively' via univariate and multivariate logistic regression analyses.

First, factors associated with 'not breastfeeding exclusively' (at the time of discharge from hospital) were examined. Subsequently, factors associated with not breastfeeding exclusively (at 6 weeks post-birth) were examined for mothers who initially exclusively breastfed in hospital. Of the 1365 biological mothers in the PIF study, infant feeding data from hospital records were available for 1247 of the mothers (91.4% of the mothers of the cohort). Data from these 1247 mothers and the responses based on the first-born twin for twin pairs were used in all analyses.

Results

Ninety-six percent (n=1590) of potentially eligible mothers of Pacific infants (who had been born between 15 March 2000 and 17 December 2000) gave consent to be visited in their homes when their infant was 6 weeks old.

Of the 1477 mothers contacted and who met the eligibility criteria, 1376 (93.2%) agreed to participate in the study. A more conservative recruitment rate of 87.1% would include mothers who consented to contact and were (a) confirmed eligible, or (b) of indeterminable eligibility due to inability to trace. Of the 1247 biological mothers in the present study (1.7% gave birth to twins; n = 21), 47.5% self-identified their major ethnic group as Samoan, 16.6% as Cook Island Maori, 4.3% as Niuean, 20.8% as Tongan, 3.5% as Other Pacific (includes mothers either identifying equally with two or more Pacific groups, equally with Pacific and Non-Pacific groups, or with Pacific groups apart from Tongan, Samoan, Cook Island or Niuean), and 7.4% as Non-Pacific. The mean age (SD) of mothers was 27.9 (6.1) years; 80.7% were living together in married or de facto partnerships, 32.8% of mothers were New Zealand born, and 27.7% had post-school qualifications.

At the time of discharge from hospital, 1017 mothers (81.6%) were exclusively breastfeeding. Of 23 variables examined for potential association with not breastfeeding exclusively at discharge from hospital, 9 reached statistical significance ($p<0.05$); findings for these variables are shown in Table 1.

Table 1. Numbers (row percentages) and odds ratios of ‘not breastfeeding exclusively’ at discharge from hospital by variables attaining significance in univariate logistic regression analyses (n=1247)

Variable	Category	Not breastfeeding exclusively			
		n	(%)	Univariate odds ratio	(95% CI)
Maternal variables					
Employed prior to pregnancy?	Yes	112	(16.5)	1.00	
	No	118	(20.8)	1.33	(1.00–1.76)*
Years in New Zealand	0-5	34	(13.5)	1.00	
	6-10	22	(16.5)	1.27	(0.71–2.28)
	>10	174	(20.2)	1.62	(1.09–2.41)*
Other variables					
Pregnancy planned	Yes	69	(15.2)	1.00	
	No	160	(20.2)	1.41	(1.04–1.92)*
Smoked during pregnancy?	No	153	(16.3)	1.00	
	Yes	77	(25.2)	1.73	(1.27–2.36)†
Saw midwife during pregnancy?	Yes	163	(16.6)	1.00	
	No	66	(25.0)	1.68	(1.21–2.32)†
Birth weight	≥2500 g	214	(17.9)	1.00	
	<2500 g	16	(32.7)	2.23	(1.21–4.12)*
Delivery method	Vaginal	180	(16.9)	1.00	
	Caesarean	50	(27.0)	1.82	(1.26–2.61)†
Multiple birth status	Single	215	(17.5)	1.00	
	Twin	15	(71.4)	11.76	(4.51–30.64)‡
Infant discharged same time as mother	Yes	219	(18.0)	1.00	
	No	11	(40.7)	3.14	(1.44–6.87)†

* $p<0.05$; † $p<0.01$; ‡ $p<0.001$.

For the categories within each variable, the numbers and percentages of mothers who reported not breastfeeding exclusively are given along with their respective univariate odds ratios (95% CI) indicating likelihood of not breastfeeding exclusively.

Variables examined, but not significantly associated with not breastfeeding exclusively, included maternal age, ethnicity, whether born in New Zealand, social marital status, education, English fluency, cultural alignment, parity, whether pregnancy was planned, whether they attended antenatal classes, alcohol consumed during pregnancy, whether general practitioners or traditional healers were seen during pregnancy, birth weight, whether the infant was discharged at the same time as mother, household size (persons), and annual household income.

Many variables examined for individual associations with not breastfeeding exclusively at discharge from hospital are likely to be interrelated. A multiple logistic regression analysis was undertaken to control for confounding effects and enable identification of important variables able to provide a parsimonious explanation of the data.

Five demographic variables (age, education, ethnicity, marital status, and household income) were initially forced into the model as control variables, and then all remaining variables were submitted to a forward stepwise procedure (p to enter = 0.15, and p to remove = 0.20).

Table 2 demonstrates that (when adjusting for all other variables in the final model) factors significantly associated with not breastfeeding exclusively ($p < 0.05$) at discharge from hospital were caesarean delivery, not being employed prior to pregnancy, living in New Zealand for more than 10 years, twin birth status, not seeing a midwife during pregnancy, and smoking during pregnancy. Variables included in the model but failing to reach significance were the five demographic control variables, and cultural alignment.

Table 2. Adjusted odds of not breastfeeding exclusively at discharge from hospital for variables attaining significance in a multiple logistic regression (n=1235)[§]

Variable	Category	Adjusted odds ratio	(95% CI)
Delivery method	Vaginal	1.00	
	Caesarean	1.75	(1.18–2.60) [†]
Employed prior to pregnancy?	Yes	1.00	
	No	1.41	(1.02–1.94) [*]
Years in New Zealand	0–5	1.00	
	6–10	1.40	(0.75–2.62)
	>10	1.80	(1.13–2.86) [*]
Multiple birth status	Single	1.00	
	Twin	11.37	(4.02–32.20) [‡]
Saw midwife during pregnancy?	Yes	1.00	
	No	1.53	(1.07–2.19) [*]
Smoking during pregnancy?	No	1.00	
	Yes	1.81	(1.27–2.58) [†]

^{*} $p < 0.05$; [†] $p < 0.01$; [‡] $p < 0.001$; [§] Variables included in the model but failing to reach significance were ethnicity, marital status, age, education, household income, and acculturation.

To examine factors associated with a change from exclusive breastfeeding in hospital to not exclusively breastfeeding by 6 weeks post birth, data from the 1017 mothers (who were initially exclusively breastfeeding) were also assessed via univariate and multiple logistic regression analyses.

Of the 1017 mothers who initially breastfed exclusively, 631 (62%) continued to do so at 6 weeks. In addition to the variables examined at the time of hospital discharge, 10 variables (based on events post-discharge and gathered at the 6-week interview) were included to identify any potential association with not breastfeeding exclusively at 6 weeks post-birth. The 10 variables were current employment status; current smoking status; alcohol consumed since birth; whether they had a home visit for the infant from a midwife, traditional healer, or a Plunket nurse; use of a dummy; infant's feeding pattern (on demand or to a schedule); whether the infant sleeps in the parental room at night; and use of regular childcare.

Fourteen variables reached statistical significance ($p < 0.05$) and findings for these variables are shown in Table 3.

Table 3. Numbers (row percentages) and odds ratios of not breastfeeding exclusively (at 6 weeks post-birth) by variables attaining significance in univariate logistic regression analyses (n=1017)

Variable	Category	Not breastfeeding exclusively			
		n	%	UOR [?]	(95% CI)
Maternal variables Ethnicity	Samoan	144	(30.3)	1.00	(1.15–2.39) [†]
	Cook Island	69	(41.8)	1.66	(0.67–2.42)
	Niuean	16	(35.6)	1.27	(1.60–3.09) [‡]
	Tongan	106	(49.1)	2.22	(0.95–3.45)
	Other Pacific [§]	18	(43.9)	1.80	(1.13–3.05) [*]
	Non Pacific	33	(44.6)	1.86	
Employed prior to pregnancy?	Yes	237	(41.7)	1.00	
	No	149	(33.2)	0.69	(0.54–0.90) [†]
Currently employed (full or part time)?	Yes	40	(74.1)	1.00	
	No	346	(35.9)	0.20	(0.11–0.37) [‡]
Cultural alignment	Low NZ, high Pacific	111	(33.2)	1.00	
	High NZ, low Pacific	137	(42.3)	1.47	(1.07–2.02) [*]
	High NZ, high Pacific	67	(37.0)	1.18	(0.81–1.72)
	Low NZ, low Pacific	65	(38.2)	1.24	(0.85–1.83)
Years in New Zealand	0–5	61	(28.0)	1.00	
	6–10	44	(39.6)	1.69	(1.04–2.74) [*]
	>10	281	(40.8)	1.78	(1.27–2.48) [†]
Parity (number of children)	1	109	(38.0)	1.00	
	2–4	203	(35.3)	0.89	(0.67–1.20)
	5+	74	(47.7)	1.49	(1.01–2.22) [*]
Other variables Smoked during pregnancy?	No	273	(34.6)	1.00	(1.36–2.48) [‡]
	Yes	113	(49.3)	1.84	
Smoked yesterday?	No	264	(33.4)	1.00	
	Yes	122	(53.7)	2.32	(1.72–3.12) [‡]
Traditional healer home visit post-birth?	Yes	51	(57.3)	1.00	
	No	335	(36.1)	0.42	(0.27–0.65) [‡]
Birth weight	≥2500 grams	368	(37.4)	1.00	
	<2500 grams	18	(54.5)	2.01	(1.00–4.03) [*]
Household income (annual)	\$0–\$20,000	111	(33.5)	1.00	
	\$20,001–\$40,000	203	(38.4)	1.23	(0.93–1.65)
	>\$40,000	58	(48.3)	1.84	(1.21–2.84) [†]
	Unknown	14	(37.8)	1.21	(0.60–2.44)
Dummy used?	No	252	(32.5)	1.00	
	Yes	134	(55.4)	2.58	(1.92–3.46) [‡]
Infant sleeps in parental room at night?	Yes	362	(37.2)	1.00	
	No	24	(55.8)	2.14	(1.15–3.95) [*]
Use regular childcare?	No	286	(34.6)	1.00	
	Yes	100	(53.2)	2.15	(1.56–2.96) [‡]

*p<0.05; †p<0.01; ‡p<0.001; §Includes mothers identifying equally with two or more Pacific Island groups, equally with Pacific Island and non Pacific Island groups, or with Pacific Island groups other than Tongan, Samoan, Cook Island Maori or Niuean; ?Univariate odds ratio.

The multiple logistic regression analysis followed that described previously, except the additional 10 variables gathered during the 6-week interview were added for potential inclusion during the stepwise procedure.

Table 4 demonstrates that, when adjusting for all other variables in the final model, factors significantly associated with not breastfeeding exclusively ($p < 0.05$) at 6 weeks post-birth were employment prior to pregnancy, being currently employed, parity of five or more children, current smoking (smoked yesterday), having a home visit from a traditional healer, not receiving a home visit from a Plunket nurse, dummy use, the infant not sharing the same room as the parents at night, regular childcare arrangements, and the infant not discharged home from hospital at the same time as the mother.

Table 4. Adjusted odds of not breastfeeding exclusively (at 6 weeks post-birth) for variables attaining significance in a multiple logistic regression (n=1004)[§]

Variable	Category	Adjusted odds ratio	(95% CI)
Employed prior to pregnancy (full or part-time)?	Yes	1.00	(0.53–0.99) [*]
	No	0.72	
Currently employed (full or part-time)?	Yes	1.00	(0.15–0.60) [†]
	No	0.30	
Parity (number of children)	1	1.00	(0.74–1.54) (1.12–3.35) [*]
	2–4	1.06	
	5+	1.94	
Smoked yesterday?	No	1.00	(1.60–3.18) [‡]
	Yes	2.26	
Traditional healer home visit post-birth?	Yes	1.00	(0.26–0.77) [†]
	No	0.45	
Plunket home visit post-birth?	Yes	1.00	(1.05–2.27) [*]
	No	1.54	
Dummy used?	No	1.00	(1.79–3.44) [‡]
	Yes	2.48	
Infant sleeps in parental room at night	Yes	1.00	(1.00–4.47) [*]
	No	2.11	
Use regular childcare?	No	1.00	(1.10–2.35) [*]
	Yes	1.60	
Infant home from hospital same time as mother?	Yes	1.00	(1.07–9.75) [*]
	No	3.22	

* $p < 0.05$; † $p < 0.01$; ‡ $p < 0.001$; § Variables included in the model but failing to reach significance were ethnicity, marital status, age, education, and household income.

Discussion

On the assumption that the more important associations between the variables examined and not breastfeeding exclusively are those identified by the multiple regression analyses, the discussion will focus on these findings.

With the exception of maternal smoking, it appears that different factors are associated with the initiation and maintenance of exclusive breastfeeding among mothers of Pacific infants. Mothers who smoked during pregnancy were almost twice as likely not to begin exclusive breastfeeding compared to non-smokers. Similarly, mothers who reported that they were current smokers were over twice as likely to have abandoned exclusive breastfeeding by 6 weeks post-birth.

The negative association between maternal smoking and breastfeeding has been reported elsewhere.^{12,13} Both physiological and psychosocial factors have been postulated to explain lower rates of initiation and duration of breastfeeding among smokers compared to non-smokers.^{7,14} It has also been suggested that some smoking women may decide against breastfeeding in order to reduce risk to their infants, unaware that not to breastfeed at all is less optimal than smoking while breastfeeding.¹⁵

Employment status was associated with not breastfeeding exclusively, but the effects differed regarding initiation and maintenance of breastfeeding. Employment prior to pregnancy reduced risk of not breastfeeding exclusively at discharge from hospital, whereas (by six weeks) both prior and current employment increased risk of not breastfeeding exclusively. Other unmeasured factors associated with being previously employed may explain the initial reduced risk, whereas the practicalities of a return to employment (or plan to return) may explain the change from initial exclusive breastfeeding to alternative feeding methods by 6 weeks post-birth.

Research suggests that the relationship between employment and breastfeeding is complex, and findings can differ depending on how and when employment status is measured. Most studies find negative associations between employment and breastfeeding, particularly the relationship between return to employment and shortened duration of breastfeeding,^{16,17} although timing and intensity of return to employment are facets that complicate this negative association.¹⁷

Factors associated with an increased risk of not breastfeeding exclusively at discharge from hospital (but not associated with continuation to 6 weeks) included longer residency in New Zealand, twin birth status, not seeing a midwife during pregnancy, and caesarean delivery. Mothers who have resided in New Zealand for over 10 years were more likely not to breastfeed exclusively at discharge from hospital compared to those who have lived here less than 5 years.

Other studies report similar findings, with shorter length of residence following immigration being associated with a greater likelihood of breastfeeding.¹⁸ Longer-term exposure to the availability of infant formulas in New Zealand may explain these differences. In concordance with other authors,^{7,19} given the obvious demands placed by multiple births, it was not surprising to find that twin birth status increased risk of not breastfeeding exclusively.

Mothers who did not see a midwife during pregnancy may have missed the opportunity to gain breastfeeding advice prior to delivery, possibly influencing feeding decisions. Other studies have also found caesarean delivery to negatively influence initiation of breastfeeding, but this is often overcome following discharge from hospital or once feeding is established.^{20,21} Hospital practices, level of postoperative recovery, effects of postoperative drugs, and child illness are possible factors that may impede initiation of breastfeeding following a caesarean delivery.²⁰⁻²²

Factors associated with an increased risk of cessation of exclusive breastfeeding (between hospital discharge and 6 weeks post-birth) included higher parity, infant not discharged home at the same time as the mother, having a home visit from a traditional healer, not receiving a home visit from a Plunket nurse, regular childcare

arrangements, dummy use, and the infant not sharing the same room as the parent(s) at night.

Inconsistent findings have been found in the literature between parity and initiation and maintenance of breastfeeding.²³ In contrast to a large, nationally representative American Study,¹³ women in our study were less likely to continue to breastfeed exclusively if they had five or more children. Additional pressures within the household posed by caring for a larger family may dissuade mothers from exclusive breastfeeding.

Mothers were over three times more likely to not continue exclusively breastfeeding if their infant was not discharged from hospital at the same time as them. Such a finding is not unexpected as this variable implies need for specialist neonatal care.

Maintenance of exclusive breastfeeding in these cases is likely to be compromised and has been observed previously.⁷ The use of regular childcare has similar constraints for breastfeeding due to absence from the infant.

Although it appears that newer migrants to New Zealand might be more traditional in terms of infant feeding practices, the finding that postnatal home visits by a traditional healer increased the risk of not breastfeeding exclusively was somewhat unexpected and warrants further study. Examination of other data for these participants indicated that, in most cases, traditional massage and/or herbal treatment was sought to assist the closure of the infant's fontanelle. It is not known whether breastfeeding was hampered by this traditional treatment or whether the healer variable acted as a proxy for other influential factors inherent in the mother or the child.

The opposite effect was observed in relation to Plunket nurses, which is encouraging news as the majority of mothers are seen by Plunket nurses. However, approximately 16% of mothers not seen by Plunket nurses, appear to have fallen through the gaps. Concern has been expressed previously about timing of the commencement of well child services—including late referrals and difficulty in locating mothers upon discharge from hospital.²⁴

Infant care practices were also associated with a greater likelihood of not breastfeeding exclusively by 6 weeks post-birth. In concordance with other studies,^{5,7,25} if the infant did not sleep in the same room as the parent(s) at night, mothers were more than twice as likely not to exclusively breastfeed. It should be noted that approximately half of those sharing the room shared the same bed (analyses not shown here).

Despite indications that mothers may bed-share for the purpose of breastfeeding,⁵ it is unclear whether bed or room sharing is causally related to, or a consequence of, not breastfeeding exclusively. Avoidance of mixed health messages is, however, of critical importance for bed sharing given that it is a common practice among Pacific families in New Zealand,²⁶ and that infants may be at increased risk for SIDS, particularly when sharing a bed with mothers who smoke.²⁷ Instead, sharing the same room rather than the same bed is recommended.²⁵

Mothers who reported their infant used a dummy were 2.5 times more likely to have changed to not breastfeeding exclusively by 6 weeks. Although dummy-use has been linked to a shorter duration of breastfeeding^{5,7,25} it remains controversial due to

inconsistent findings.²⁸ As with bed or room sharing, it is not known whether dummy-use is a cause, or consequence, of reduced breastfeeding.

In conclusion, several factors were identified to be independently negatively associated with exclusive breastfeeding at the time of discharge from hospital and at 6 weeks post-birth. Many of these factors (eg, maternal smoking) support previous research, while others (such as the use of traditional healers) are more specific to the Pacific Island population and require further investigation within the New Zealand context.

Health professionals should be alerted to circumstances that may lead to unsuccessful establishment or maintenance of exclusive breastfeeding. As not all risk factors are modifiable, it is important to emphasise those that are, such as smoking. Furthermore, mothers should be encouraged to lead healthier lifestyles and be educated on ways to reduce possible harm to their infants¹⁵—not only for greater success with breastfeeding, but as a preventative risk factor for SIDS and other negative health consequences.²⁹

The message to continue breastfeeding exclusively for the first 6 months (despite smoking) should be reiterated—as it may provide additional protection for the infant against respiratory illness.³⁰

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